

Public Exposure to Arsenic in Drinking Water in Michigan

Prepared for Rep. David E. Bonior

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EXECUTIVE SUMMARY

In January 2001, the Environmental Protection Agency established a new safe drinking water standard for arsenic, a toxic, cancer-causing compound. This standard, promulgated in response to a congressional mandate and a comprehensive study by the National Academy of Sciences, was set at 10 parts per billion. On March 20, 2001, following lobbying efforts by the mining and chemical industries, new EPA Administrator Christine Todd Whitman announced that this rule would be revoked.

In response to this action, Rep. David E. Bonior requested an investigation into exposure to arsenic in drinking water in Michigan. This report presents the results of this investigation. Based on previously unpublished data from EPA, the report finds that as many as 367,000 Michigan citizens may be exposed to dangerous levels of arsenic in drinking water.

Most Americans are familiar with arsenic as an acutely toxic compound. However, fewer realize that arsenic is a pervasive drinking water contaminant that increases the cancer risks of millions of Americans. In June 1999, the National Academy of Sciences released a comprehensive study of arsenic that found that the contaminant was a known and extremely potent human carcinogen. The Academy found that exposure to arsenic in drinking water causes lung, bladder, and skin cancer. In addition, EPA has found that arsenic exposure is linked to liver and kidney cancer.

Prior to January 2001, the standard for arsenic in drinking water allowed 50 parts per billion (ppb) of arsenic in drinking water. This 50 ppb standard was developed in 1942. According to the National Academy of Sciences, exposure to arsenic at the level of the 1942 standard “could easily result in a combined cancer risk on the order of 1 in 100.” This risk estimate, which assumes that individuals are exposed to the drinking water contaminant for a lifetime (70 years), is significantly higher than the maximum cancer risk typically allowed by Safe Drinking Water Act standards. Because of these high risks, the 1999 National Academy of Sciences study called on EPA to lower the arsenic standard “as promptly as possible.”

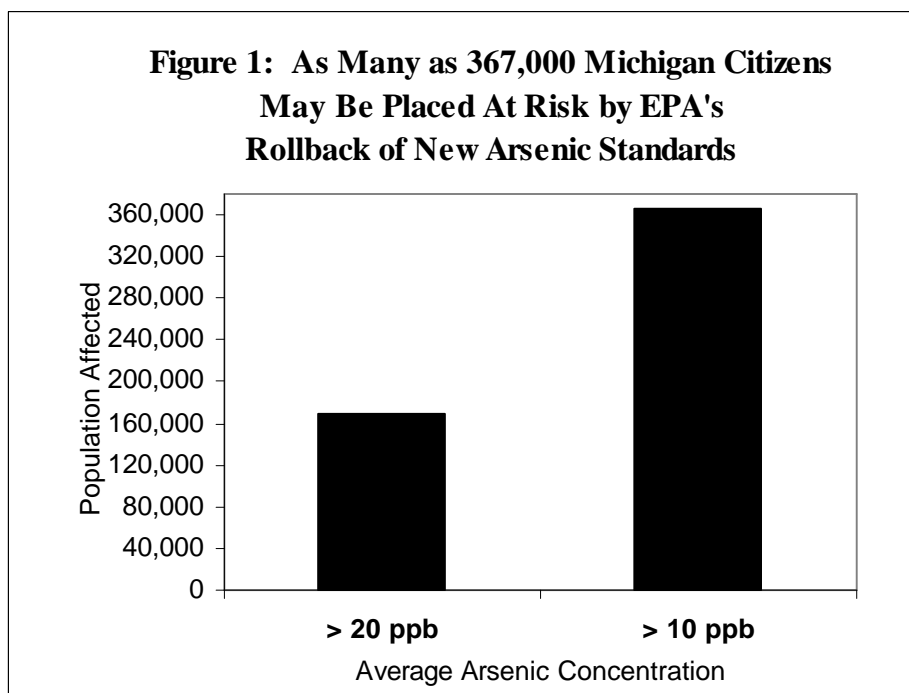
In response to the findings of the National Academy of Sciences, EPA proposed a new and more stringent standard for arsenic in drinking water in June 2000. The arsenic standard was finalized in January 2001 at the level of 10 ppb. This standard is equivalent to the standards adopted by the World Health Organization and the European Union. In March 2001, however, new EPA Administrator Christine Todd Whitman announced that the agency would be revoking the standard. The Administrator, citing arguments made by the mining and chemical industries, claimed that, “we should be sure the facts support imposing the federal standard.”

To assess the impacts of revocation of the arsenic standard, Rep. David E. Bonior asked the Special Investigations Division of the minority staff of the Committee on Government Reform to investigate arsenic levels in drinking water in Michigan. As part of this investigation, the Special Investigations Division obtained previously unreleased data from EPA. This data is based on the results of testing arsenic levels in treated tap water in almost 1,000 drinking water systems in Michigan. According to EPA, although its state-specific occurrence estimates should

be treated with caution, they represent “EPA’s best estimate of occurrence distributions . . . at this time.”

The Michigan data obtained from EPA indicates that as many as 367,000 individuals in approximately 176 communities in Michigan may be drinking water that contains arsenic at concentrations that exceed 10 ppb. Moreover, the EPA data estimates that as many as 169,000 Michigan citizens may be drinking water that has arsenic at levels that are more than twice as high as the 10 ppb standard (Figure 1).

Overall, 12% of Michigan water systems are estimated to contain arsenic at levels that exceed 10 ppb. Only two states have a higher percentage of systems affected by high arsenic levels, and only four states are estimated to have more citizens exposed to arsenic at levels above 10 ppb.



I. HEALTH EFFECTS OF ARSENIC IN DRINKING WATER

A. Sources of Exposure to Arsenic

Exposure to arsenic occurs in several forms and from various sources. Exposure to arsenic in drinking water presents the greatest risk to public health. Although a form of arsenic can also be found in food, the risks from this form of pose fewer health risks than arsenic in drinking water.

Arsenic is a naturally occurring compound that generally leaches into water sources from geologic formations. It can also be released into the environment through volcanic action, erosion of rocks, and forest fires.¹ Human activities -- such as the burning of fossil fuels, cement production, smelting of metal ores, past use of arsenic-based pesticides, and mining -- can also release arsenic into the environment.² Ninety percent of the arsenic used in industrial activities is used as a wood preservative, with the remainder used in paints, dyes, metals, drugs, soaps, and semiconductors.³

B. Arsenic is a Known Human Carcinogen

Numerous studies in humans have shown that arsenic is a potent carcinogen and that exposure to arsenic in drinking water significantly increases cancer risks. According to the National Academy of Sciences, “[t]here is sufficient evidence from human epidemiological studies . . . that chronic ingestion of inorganic arsenic causes bladder and lung cancer, as well as skin cancer.”⁴ In addition, EPA has found that exposure to arsenic may increase the risk of liver and kidney cancer.⁵

The findings from many of the studies that show that arsenic causes cancer are compelling because they are based on studies of humans exposed to elevated levels of arsenic, not just on studies of animals. According to the National Academy of Sciences, studies of populations exposed to elevated arsenic levels in Taiwan, Chile, and Argentina point to increase

¹EPA, *Drinking Water Standard for Arsenic* (Jan. 2001) (online at www.epa.gov/safewater/ars/ars_rule_factsheet.html).

²*Id.*

³*Id.*

⁴National Research Council, *Arsenic in Drinking Water* (June 1999).

⁵EPA, *National Primary Drinking Water Regulations: Arsenic*, 7001 (Jan. 22, 2000).

risk of bladder and lung cancer.⁶ A recent study of Utah residents found a statistically significant increase in prostate cancer risk for individuals exposed to higher levels of arsenic.⁷ Studies of humans exposed to arsenic in medicines and pesticides also show an increase in skin cancer risks.⁸

The National Academy of Sciences has expressed concern about the varying sensitivity of individuals to arsenic in drinking water. Because of age, genetic makeup, nutritional status, or other factors, some individuals may be susceptible to health risks from exposure to arsenic at concentrations that would not affect others.⁹ For example, one disturbing study found that children metabolize arsenic at a slower rate than adults. According to the Academy, the study “might indicate that children are more sensitive to arsenic than adults.”¹⁰

Recent studies have confirmed the risk of cancer from drinking tap water contaminated with arsenic, as well as providing insight into the reason why arsenic causes cancer. A March 2001 study found that arsenic is an endocrine-disrupting chemical, and may cause cancer by blocking or mimicking the action of natural hormones. This study found that arsenic concentrations as low as 10 ppb -- the same level as the new standard -- could cause these hormone-disrupting effects.¹¹

C. The Cancer Risks from Drinking Arsenic-Containing Tap Water

The accumulated evidence of the cancer-causing potential of arsenic indicates that arsenic is an extremely potent human carcinogen, and that exposure to arsenic at the old standard of 50 ppb presents extraordinarily high cancer risks. According to the National Academy of Sciences, exposure to arsenic at the 50 ppb standard “could easily result in a combined cancer risk on the order of 1 in 100,”¹² meaning that approximately 1 out of every 100 individuals exposed to this level of arsenic in drinking water for a lifetime (70 years) would be expected to get cancer.

⁶*Arsenic in Drinking Water*, *supra* note 4, at 2.

⁷*National Primary Drinking Water Regulations: Arsenic*, *supra* note 5, at 7002.

⁸*Id.* at 7002.

⁹*Arsenic in Drinking Water*, *supra* note 4, at 8.

¹⁰*Id.* at 232.

¹¹Kaltreider, et al., *Arsenic Alters the Function of the Glucocorticoid Receptor as a Transcription Factor*, *Environmental Health Perspectives*, 109, 245-251 (2001).

¹²*Arsenic in Drinking Water*, *supra* note 4, at 8.

Almost all cancer risk assessments are surrounded by considerable uncertainty.¹³ Nevertheless, the National Academy of Sciences findings indicate that drinking water with 50 ppb of arsenic presents an exceptionally high cancer risk. For comparison, the risk is significantly higher than the maximum cancer risks typically allowed by Safe Drinking Water Act standards.¹⁴ The cancer risk for individuals exposed for a lifetime to 50 ppb of arsenic in drinking water is roughly equivalent to the risk of death in an automobile accident or the risk of death by homicide.¹⁵

D. Other Health Effects of Arsenic

In addition to increasing cancer risks, a “multitude of multisystemic non-cancer effects” may be caused by arsenic exposure.¹⁶ For example, recent epidemiological studies have shown that prolonged exposure to arsenic can cause high blood pressure and increase mortality rates from cardiovascular disease.¹⁷ Other studies have shown that arsenic exposure can increase the risk of diabetes, cause gastrointestinal problems, and cause numerous other health problems.¹⁸

Finally, although the National Academy of Sciences found that more research into the subject is necessary, studies have shown that arsenic can pass through the placenta, potentially presenting reproductive or developmental risks to humans.¹⁹ Animal studies have shown that arsenic exposure can cause birth defects.

¹³For example, scientists use conservative assumptions in extrapolating risks from animals to humans or from high to low doses, and cancer risk estimates are generally described as the “upper bounds” of the risk.

¹⁴When developing drinking water standards for carcinogens EPA generally attempts to reduce risks to a maximum of approximately 1 additional cancer case per 10,000 exposed individuals. EPA, *Proposed Rule: National Primary Drinking Water Regulations: Arsenic*, 38948 (May 2000).

¹⁵The annual fatality rates for deaths in automobile accidents is 16 in 100,000. This fatality rate translates into approximately 1 in 100 over 70 years. Similarly, the annual homicide rate is approximately 8 per 100,000, or approximately 1 in 200 over 70 years. U.S. Department of Commerce, *Statistical Abstract of the United States* (1997).

¹⁶*Arsenic in Drinking Water*, *supra* note 4, at 101.

¹⁷*Id.* at 132.

¹⁸*Id.* at 132.

¹⁹*National Primary Drinking Water Regulations: Arsenic*, *supra* note 5.

II. REGULATION OF ARSENIC IN DRINKING WATER

The first standard for arsenic in drinking water was established in 1942 by the U.S. Public Health Service.²⁰ It has been in place for 58 years, longer than any other current drinking water standard. The arsenic standard predates the Environmental Protection Agency, which was established in 1970, by 28 years.

The Safe Drinking Water Act of 1974 gave EPA the authority to establish national drinking water standards and specified that EPA establish standards for drinking water contaminants that posed a public health risk. On December 24, 1975, EPA issued a National Interim Primary Drinking Water Regulation for arsenic that codified the Public Health Service standard.²¹ This “interim” standard remained in effect until passage of the 1986 Safe Drinking Water Act amendments.²² These amendments converted the 1975 interim arsenic standard to a final National Primary Drinking Water Regulation.

In 1996, with the original 1942 arsenic standard still in effect, Congress again amended the Safe Drinking Water Act, this time establishing a new statutory deadline for EPA to examine and issue an arsenic standard. Congress required that EPA propose a drinking water standard for arsenic not later than January 1, 2000, and finalize the standard not later than January 1, 2001. This deadline was later extended to June 22, 2001.

In June 1999, the National Academy of Sciences reviewed available research and concluded that the 50 ppb standard is inadequate. Based on this review, the Academy concluded that the standard should be revised “as promptly as possible.” EPA proposed a new arsenic standard of 5 ppb in May 2000.²³ After further analysis and comment from the public, EPA relaxed the standard to 10 ppb, issuing the final standard for arsenic on January 22, 2001.

According to the Agency:

The current standard of 50 ppb was set by EPA in 1975, based on a Public Health Service standard originally established in 1942. A March 1999 report by the National Academy of Sciences concluded that the current standard does not achieve EPA’s goal of protecting public health and should be lowered as soon as possible. . . . EPA is proposing to change the arsenic standard in drinking water to

²⁰*Id.*

²¹40 Fed. Reg. 59566 at 59570.

²²Safe Drinking Water Act, Public Law 99–339.

²³EPA, *Proposed Rule: National Primary Drinking Water Regulations: Arsenic*, *supra* note 7, at 38888 - 38983.

10 ppb to protect consumers against the effects of long-term chronic exposure to arsenic in drinking water.²⁴

On March 20, 2001, new EPA Administrator Christine Todd Whitman announced that the agency would withdraw the new safe drinking water standard for arsenic, leaving in place the standard that has been in existence since 1942. This announcement was described as a “victory . . . for the mining industry,” which, along with chemical companies and wood processors, had strongly lobbied against the proposal.²⁵

Despite the National Academy of Sciences study and the decade of work that had gone into the proposal, Administrator Whitman stated that “we should be sure the facts support imposing the federal standard.” In announcing that the standard would be revoked, Administrator Whitman set no deadline for establishing a new standard, and gave no indication whether a new standard would ultimately be set at a level that would adequately protect public health.

III. EXPOSURE TO HIGH LEVELS OF ARSENIC IN DRINKING WATER IN MICHIGAN

As part of its development of a new drinking water standard for arsenic, EPA prepared detailed national, regional, and state estimates of the populations exposed to arsenic at different concentrations.²⁶ In order to assess the impact of the Bush Administration decision to revoke the arsenic standard, the Special Investigations Division of the minority staff of the Committee on Government Reform obtained these estimates from EPA.

The estimates are based on compliance monitoring of treated tap water conducted by individual drinking water systems. EPA obtained almost 77,000 testing results from 22,659 water systems in 25 states. Quality control by EPA eliminated errors and ensured that samples in the database were samples of treated tap water. Based on the data from the 25 states with monitoring data, EPA developed regional estimates of the number and percentage of drinking waters systems affected by arsenic contamination. The agency then applied these estimates to states and territories where actual monitoring data was not available.

Nationally, the EPA data indicates that an estimated 5.7 million Americans are exposed to drinking water with arsenic levels above 10 ppb. According to EPA, the national estimates

²⁴*Proposed Revision to Arsenic Drinking Water Standard, supra* note 1.

²⁵*EPA to Abandon New Arsenic Limits for Water Supply*, New York Times (Mar. 21, 2001); *EPA Revokes Drinking Water Rule*, Washington Post (Mar. 21, 2001).

²⁶EPA, *Estimates of Mean Arsenic Concentrations in Drinking Water, by Public Water System, State, and Region* (Mar. 22, 2001).

“are based on the most data, and so are the most reliable.”²⁷ EPA’s regional estimates indicate that the areas with high arsenic levels in drinking water are concentrated in several regions of the country. In the West, an estimated 3.3 million Americans are exposed to arsenic levels above 10 ppb. Other regions with high exposure to arsenic include the Midwest and New England, each with approximately one million individuals estimated to be exposed to arsenic at levels above 10 ppb.

EPA’s data also contains state-specific estimates of the occurrence of arsenic in drinking water. In 25 states, including Michigan, the estimates are based on monitoring of treated tap water. According to EPA, “[o]ccurrence estimates in individual states should be treated with caution. Even in states that submitted occurrence data to EPA, estimates are based on less data than the national estimates, and so must be considered to be less reliable.”²⁸ Nevertheless, EPA regards these state-specific estimates as containing the best available information on arsenic levels in individual states, stating that “the estimates listed here are EPA’s best estimates of the occurrence distributions in these states at this time.”²⁹ In the case of Michigan, the EPA estimates of arsenic occurrence are based on actual monitoring results from treated drinking water in almost 1,000 drinking water systems in the state.

The EPA data indicates that as many as 367,000 Michigan citizens in 176 communities may be drinking water with arsenic levels that exceed the 10 ppb standard. According to this data, as many as 169,000 Michigan citizens in 76 communities may be drinking water with extremely high arsenic concentrations of 20 ppb or more (Table 1).

Overall, 12% of Michigan water systems are estimated to contain arsenic at levels that exceed 10 ppb. Only two states -- Arizona and Nevada -- have a higher percentage of systems affected by high arsenic levels. Only four states -- California, Arizona, New York, and Washington -- are estimated to have more citizens exposed to arsenic at levels above 10 ppb.

Table 1: As Many As 367,000 Michigan Citizens May Drink Water with High Arsenic Levels (> 10 ppb)

Arsenic Concentration in Drinking Water	Estimate Number of Affected Communities in Michigan	Estimate of Population Exposed in Michigan
> 10 ppb	176	367,000
> 20 ppb	76	169,000

The Special Investigations Division was unable to obtain final data from EPA on arsenic

²⁷*Id.*

²⁸*Id.*

²⁹*Id.*

levels in individual water systems in Michigan.

V. CONCLUSION

Many Michigan citizens appear to be exposed to high concentrations of arsenic in their drinking water, increasing their risk of cancer and presenting additional health risks. In January 2001, after a decade of effort and in response to a comprehensive National Academy of Sciences study, EPA announced a new standard of 10 ppb for arsenic in drinking water. In March 2001, after heavy lobbying by mining and other affected industries, new EPA Administration Christine Todd Whitman decided that the agency would revoke this new standard. The findings of this report indicate that as a result of the revocation of the standard, as many as 367,000 Michigan citizens may continue to face health risks from high levels of arsenic in their drinking water.